

clearly displayed, and, although more elementary in its treatment, the book is a worthy companion of Whittaker's well-known "History of the Theories of Elasticity and the Ether." An English volume of similar scope would be a very desirable addition to current text-books.

R. S. W.

LETTERS TO THE EDITOR.

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The Theory of Radiation.

THE natural unit of angular momentum postulated by Dr. Niels Bohr, of Copenhagen, in his researches on the theory of spectral lines actually exists. It is the angular momentum of the magneton. Rejecting entirely the idea of magnetic or electric substance, the magneton may be regarded as an inner limiting surface of the æther, formed like an anchor-ring. The tubes of electric induction which terminate on its surface give it an electric charge, the magnetic tubes linked through its aperture make it a permanent magnet.

I find that the angular momentum of any such system, whatever its shape or dimensions, about its axis of symmetry is $(8\pi^2 V)^{-1} e\mu$. V is the velocity of light, e the electric induction over the surface, and μ the magnetic induction over the aperture. I shall consider elsewhere the applications to the theory of complete radiation, spectral series, and the asymmetrical emission of electrons in ultra-violet light. Only this need be mentioned. If an electron (charge e) be thrown off from a magneton like a speck of dust from a flying wheel, then the angular momentum of the magneton changes by the amount $-1(2\pi V)^{-1} \mu$. This is therefore the angular momentum of the ejected electron about the axis of the magneton. Taking the velocity of ejection to be proportional to the angular velocity in the magneton, we have Ladenburg's result that the energy of the emitted rays varies as the frequency.

Dr. Bohr, by first insisting on the fact that Planck's h is an angular momentum, has done something of the greatest importance, whatever the ultimate fate of his particular interpretation. Dr. Nicholson has, I think, used the same idea.

G. B. McLAREN.

University College, Reading, September 20.

Stability of Aëroplanes.

IN his experiments on the resistance of the air to spheres, M. Eiffel showed that for a certain critical velocity for a given sphere the resistance suddenly fails. The critical velocity appears to be very different for different spheres; e.g. in his paper (*Comptes rendus*, December 30, 1912) the sudden change is shown to begin at velocities of 12, 7, and 4 metres per second for spheres of diameter 16.2, 24.4 and 33.0 cm. respectively.

Suppose we make a triangular frame with one of these spheres at each corner and allow the frame to fall from a height. It would appear that if the weights of the spheres were so adjusted that the frame would

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maintain a horizontal position for a part of its flight, it must reach some velocity at which the equilibrium of the resisting forces would be destroyed, and rotation would ensue, tending to make the frame take up a vertical position.

If such a law holds for bodies of other shapes than spheres, it would appear that an aëroplane would have a much better chance of being stable in winds of great variety of velocities, if the resisting surfaces were all of the same size and shape.

I do not know whether this case has already been dealt with by others, and I make the suggestion for what it may be worth.

G. A. SHAKESPEAR.

The University, Birmingham.

The Pancreatic Treatment of Tuberculosis and Malaria.

THERE are two points in Dr. Saleeby's remarks upon p. 61 of NATURE (September 18, 1913) which I should like to notice briefly. In my letter to you on the same page I did not refer to Baetzner's brilliantly successful results in the treatment of tuberculosis by pancreatic enzymes (*The Practitioner*, January, 1913, pp. 203-219), because after his prolonged investigations the thing is an accomplished fact, which cannot be disputed by any interested in its operative treatment. I am neither a medical practitioner nor the apostle of a new faith, but merely a scientific investigator. I foresaw, and foretold, the complete success of this treatment of tuberculosis in 1907; and with the fulfilment of this scientific forecast at the hands of Dr. M. A. Cleaves in that year and of Dr. W. Baetzner more recently, my concern with the matter has ended. Moreover, I have taught medical students for more years than I care to think of, and I know how hopeless it is to try to teach something new of a scientific nature to the medical profession.

As to the sexual phases of the life-cycle in malaria, they are of no practical importance at all in the treatment of malaria by enzymes. A reference to Major Lamballe's original manuscript shows that the presence of such sexual phases had been verified in several of his cases. Like all the clinical symptoms, such as in grave cases, delirium and coma, these sexual phases vanished and did not return, when the Fairchild injections of trypsin and amylopsin were administered. These sexual phases, the so-called "crescents," have a scientific interest, but scarcely a clinical importance, as Major Lamballe also recognises. The disease is not continued by them any more than cancer is continued by the cells, to which Prof. Farmer gave the name of "gametoid tissue." Probably they are got rid of by the leucocytes, but, in any case, in ordinary circumstances the pancreatic ferments would be devoid of action upon such sexual phases, as my experiments upon various non-pathogenic micro-organisms demonstrated (*vide* Beard, J., on the occurrence of dextrorotatory albumins in organic nature, *Biol. Centralblatt*, vol. xxxiii., pp. 150-170, 1913).

J. BEARD.

8 Barnton Terrace, Edinburgh, October 1.

Relative Productivity of Farm Crops in Different Countries.

IN view of the repeated statements that British farming is declining and that the world is threatened with a shortage of wheat supplies, the following extract from the results of an investigation into the facts regarding both these questions may be of interest. Lack of space precludes reference to the

sources of information, the statement of the results for all countries, details as to the method of investigation, and so on, but the condensed tabular summary which follows is typical of the results as a whole:—

—	Wheat			Oats			Barley			Potatoes		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
United Kingdom	1. 1'4	3'4	2'4	4'2	6'9	1'6	5'0	9'4	1'9	5'3	6'8	1'3
	2. 1'0	2'3	2'4	3'9	6'0	1'6	3'9	7'3	1'9	4'0	4'9	1'2
	3. 0'7	1'7	2'4	3'4	5'0	1'5	2'6	4'7	1'8	3'4	4'5	1'3
France	1. 9'0	13'2	1'5	8'9	10'2	1'1	5'0	6'0	1'2	13'5	15'6	1'1
	2. 8'1	11'8	1'5	8'7	8'3	1'0	3'9	4'5	1'2	11'1	10'4	0'9
	3. 6'7	9'8	1'5	7'6	7'9	1'0	2'5	2'9	1'2	10'5	8'6	0'9
Russia	1. 15'7	10'7	0'7	34'3	22'0	0'6	25'8	16'3	0'6	14'2	8'3	0'6
	2. 8'1	11'8	0'7	33'0	22'4	0'7	30'9	21'0	0'7	24'6	16'4	0'7
	3. 19'6	14'3	0'7	32'3	22'8	0'7	30'0	21'7	0'7	28'0	19'7	0'7
United States	1. 19'3	18'7	1'0	22'6	24'8	1'1	5'6	7'0	1'3	9'2	5'0	0'5
	2. 20'5	21'6	1'0	24'0	2'7	1'0	5'5	6'8	1'2	8'9	4'7	0'5
	3. 19'6	20'4	1'0	24'1	25'1	1'0	8'1	10'3	1'3	8'9	5'5	0'6
World changes in yield per acre	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	100	103	113	100	112	122	100	106	115	100	108	114

Decades—(1)=1881-1890. (2)=1891-1900. (3)=1901-1910.
(a) Percentage of world's acreage. (b) Percentage of world's crop.
(c) Ratio of (b) to (a)=relative productivity per acre.

Column (a) gives the average percentage acreage for the three last decades, and column (b) the average percentage total crop; France is typical of the countries which have declined, and Russia of those which have improved under these heads. Column (c) measures relative productivity, which has been practically constant all the world over for the three decades. Information is added to show the increases which have taken place for the world as a whole in relative yield per acre.

The end of the nineteenth century may be considered as the close of a commercial revolution due to improved communications and transport, &c., and therefore the period under review is notably distinct from earlier epochs, so that the relative constancy of the productivity of these and other crops may be held to be a characteristic of this revolutionary period. Farming is a world business; improved results are common to all countries. The figures are instructive with reference to the threat of a world famine, e.g. if Russia only improved to the level of the United States, there would be an increase of 6 per cent. in the world's crop of wheat. At the same time it becomes obvious that the British farmer is the most successful farmer in the world; he always obtains a higher yield for each acre of land he tills. These are but the most important conclusions to which these results point; others may suggest themselves to your readers.

B. C. WALLIS.

Granville Road, North Finchley, N.

The Elephant Trench at Dewlish—Was it Dug?

I WAS not aware that it had occurred to Mr. Clement Reid, before it had done so to me, whether the Elephant Trench might have been excavated by man. He does not refer to this in his survey memoir on the Dorchester district; and so far as I can recollect he did not mention it when I described the trench with lantern slides at the meeting of the British Association at Cambridge in 1904. He now states

(NATURE, Sept. 25) that he is convinced that the trench was due to *natural agencies*, and suggests that it was "probably wind-cut by the swirl of the fine dust-like quartz sand which, mixed with polished flints, now fills the lower part."

For my part I cannot imagine how such a trench could have been formed in that manner. He says that he found the sides of the trench "curiously smooth, and no tool marks nor rubbings such as might be made by man working in the trench, or by wild beasts," and also that the flint nodules projected into the cavity from either side as though the softer chalk had been scoured away. The fine sand which partially fills the trench is, I think, to all appearances wind-borne; and during the long interval which probably elapsed before the trench had become filled up by natural agencies the surface of its walls would have become weathered away, and, possibly abraded by the sand, leaving the courses of flints projecting, and completely obliterating any tool marks.

Mr. Reid remarks: "If this sand-filled fissure is found to continue downwards, but is too narrow for a man to work in, it will show that the trench is not artificial." On the other hand, my late lamented friend the Rev. R. Ashington Bullen wrote to the *Geological Magazine* (July, 1910, p. 334), describing a pitfall to catch antelopes. It was 10 ft. deep, 2 ft. wide at the top, narrowing at the bottom to a few inches.

I may, however, say that when I dug at the end of the trench on the hill-face I came to the conclusion that the bottom of the trench was a flat chalk surface, and near the bottom I found some angular coarse gravel, and among it a nearly worn-down molar along with the polished flints. If, as Mr. Reid suggests, the trench was excavated by wind, which appears to me impossible, all the flints corresponding to the chalk so removed ought to lie, now, unbroken at the bottom, but in my notebook I find the remark that the flints in this gravel did not appear to have come "from the chalk direct."

I am extremely glad that Mr. Reid's interesting reply to my letter shows that I have succeeded in directing the attention of geologists to this, as I believe, important question.

O. FISHER.

Graveley, Huntingdon, September 26.

REFERRING to Mr. Clement Reid's letter on the origin of the Elephant Trench at Dewlish, in *NATURE* of September 25, on the Yorkshire wolds holes are not infrequently scooped out of the chalk by what are locally termed "cloudbursts." One such, 13 ft. deep, occurred in the parish of South Cave last year.

G. W. B. MACTURK.

15 Bowlalley Lane, Hull, October 4.

A New Poet of Nature.

READERS of *The English Review* must be inured to shocks; but among the revolutionary visions which its young men have seen, surely nothing more startling has been recorded than this, which I extract from a short poem entitled "Early One Morning":—

"Have you heard what the young moon said to me
As I walked in the morning early?

She lay on her back and laughed at me
As I walked in the morning early."

W. D. E.